

What is claimed is:

1. An electric power generation system comprising

5 (a) a fuel cell stack connectable to an external electrical circuit for supplying electric current to said external circuit, said stack comprising at least one solid polymer fuel cell and fluid stream passages for directing fluid streams through said at least one fuel cell; and

10 (b) a purge system comprising a purge conduit having an inlet end connectable to a purge fluid supply and an outlet end connected to at least one of said fluid stream passages, and a purge flow control device for controlling the flow of a pressurized purge fluid through said purge conduit such that water is capable of being purged from at least one of said fluid stream passages after

15 a supply of electric current from said stack to said external circuit has been interrupted.

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2. The electric power generation system of claim 1 wherein said fluid stream passages are reactant stream passages.

3. The electric power generation system of claim 2 wherein said reactant stream passages comprise oxidant stream passages.

4. The electric power generation system of claim 2 wherein said reactant stream passages comprise fuel stream passages.

5. The electric power generation system of claim 1 wherein said fluid stream passages comprise a coolant passage.

6. The electric power generation system of claim 1 wherein said purge flow control device comprises a control valve connected to said purge conduit.

7. The electric power generation system of claim 6 wherein said purge flow control device further comprises a control unit communicative with said control valve and with an input signal source.

8. The electric power generation system of claim 7 wherein said control unit is a micro-controller.

9. The electric power generation system of claim 1 wherein said purge system further comprises a pressure regulator associated with said purge conduit for regulating the pressure of

5 said purge fluid from said purge fluid supply to
said at least one reactant passage.

10. The electric power generation system of
claim 1 wherein said purge fluid is inert.

11. The electric power generation system of
claim 11 wherein said purge fluid is nitrogen.

12. An electric power generation system
comprising:

- 5 (a) a fuel cell stack connectable to an
external electrical circuit for
supplying electric current to said
external circuit, said stack comprising
at least one solid polymer fuel cell,
and reactant stream passages for
directing reactant streams through said
10 at least one fuel cell; and
- (b) a humidifier in fluid communication with
at least one of said reactant stream
passages, for humidifying a reactant
stream supplied to said fuel cell stack;
15 and
- (c) a humidifier bypass system comprising at
least one bypass conduit for directing
said reactant stream to said stack in
fluid isolation from said humidifier and
20 a bypass control device for selectively
directing flow of said reactant stream
to said fuel cell stack through either

of said humidifier and said humidifier
bypass conduit.

13. The electric power generation system of
claim 12 wherein said at least one bypass conduit
comprises an inlet end connected to one of said
reactant stream passages upstream of said
5 humidifier, and an outlet end connected to one of
said reactant stream passages downstream of said
humidifier.

14. The electric power generation system of
claim 12 wherein said at least one bypass conduit
comprises an inlet end connectable to a reactant
supply, and an outlet end connected to one of said
5 reactant stream passages downstream of said
humidifier.

15. The electric power generation system of
claim 12 wherein said control device is operable
such that said reactant fluid is directed to said
humidifier while electrical power is being
5 generated by the stack and to said bypass conduit
after a supply of electric current from said stack
to said external circuit has been interrupted.

16. The electric power generation system of
claim 15 wherein said bypass control device
comprises a bypass inlet valve connected to one of
said reactant passages upstream of said
5 humidifier, and a bypass outlet valve connected to

one of said reactant passages downstream of said humidifier, and wherein said bypass conduit is connected to said bypass inlet and outlet valves.

17. The electric power generation system of claim 16 wherein said bypass control device further comprises a control unit communicative with said bypass inlet and outlet valves and with
5 an input signal source.

18. The electric power generation system of claim 18 wherein said control unit is a micro-controller.

19. The electric power generation system of claim 12 wherein one of said reactant passages is an oxidant flow passage.

20. The electric power generation system of claim 12 wherein one of said reactant passages is a fuel flow passage.

21. An electric power generation system comprising

- 5 (a) a fuel cell stack connectable to an external electrical circuit for supplying electric current to said external circuit, said stack comprising at least one solid polymer fuel cell, and fluid stream passages for directing

10 fluid streams through said at least one
fuel cell; and

(b) a mechanism for directing the flow of a
pressurized purge fluid from a purge
fluid supply to at least one of said
fluid stream passages such that water
15 can be purged from said at least one
purged fluid stream passage after a
supply of electric current from said
stack to said external circuit has been
interrupted.

22. An electric power generation system
comprising

(a) a fuel cell stack connectable to an
external electrical circuit for
5 supplying electric current to said
external circuit, said stack comprising
at least one solid polymer fuel cell,
and reactant stream passages for
directing reactant streams through said
10 at least one fuel cell;

(b) apparatus for humidifying at least one
of said reactant streams supplied to
said fuel cell stack; and

(c) a humidifier bypass system comprising
15 apparatus for directing at least one of
said reactant streams to said stack in
fluid isolation from said humidifying
apparatus, and apparatus for selectively
directing flow of said reactant streams

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to said fuel cell stack through said
humidifying apparatus or in fluid
isolation from said humidifying
apparatus.